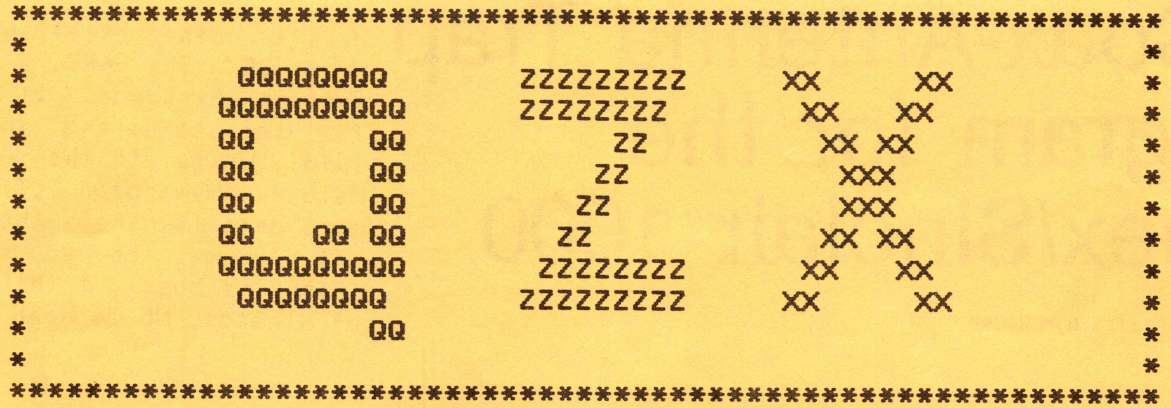

The Journal Covering Amateur Radio & Sinclair Computers
ZX-80; Micro-Ace; ZX81; T/S 1000, 1500, & 2068
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K5XY
Alex. F. Burr
Publisher

W4GHV/5
Bo Barry
Editor

Volume 2 Number 11 ($1.50/issue) October 1984

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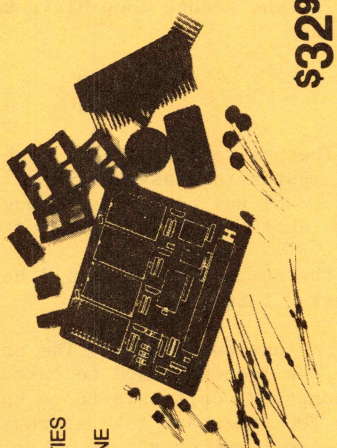

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We found the documentation to be far superior to that (of) most hardware we've received. **(S.U.N. Newsletter Nov/Dec 82)**

For versatility this is even better than an EPROM...ranks quite high on the list of "must-haves"... **(SYNC Magazine Mar/Apr 83)**

Provides the user with instant software...an extremely versatile memory extension... **(Z-WEST June 83)**

INTRODUCTION

This memory board is designed to fill the transparent 8K block of memory (from 8K to 16K) in a ZX81-16K system. This area of memory is an ideal place to store, either permanently or temporarily, machine language routines or data which are to be used by the BASIC system.

Sample utilities are included with the kit.

The use of HM6116LP 2K CMOS RAM memory IC's with their own reserve power supply means that routines stored in the RAM are nonvolatile — the RAM retains its memory even when the ZX81 is switched off or reset. Moreover, being RAM, the routines you store in the memory are easily modified. The lithium cell supplied with the board will maintain sufficient reserve power for almost ten years.

ASSEMBLY

Complete step-by-step instructions in a 20 page manual make assembly of the board easy. The kit (pictured above) is complete with a silkscreened solder-masked printed circuit board, all capacitors, resistors, transistors, sockets, connectors, integrated circuits, and the lithium cell. The board is supplied with one 2K CMOS 6116LP-3 RAM — it will accomodate three more for a total of 8K.

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A Coax-Antenna Trap Program for the Timex/Sinclair 1000

Here's another excellent article from QEX The ARRL's Experimenters' Exchange. It is always full of useful and interesting info. Write to the ARRL, 225 Main St, Newington, CT 06111 for more details. The author of this article may be 'you know who' (Barney's boss), I think his QTH of Kinston, NC is near Mayberry!

By Andy S. Griffith,* W4ULD

The Technical Correspondence column in the March 1984 issue of QST featured an article by Frank Noble, W3MT, on coax antenna traps. It was of special interest to me since I had just completed a similar analysis for the TIMEX/SINCLAIR 1000 computer. I used a different approach than Frank because I wanted to solve for the number of turns in the trap when given coax specifications, coil form diameter, and frequency. My computer program is shown later. I will first go through the method I used for those who wish to program other computers. Analyzing my step-by-step procedure might lead the proficient programmer to a better approach.

Using N for the number of turns of coax required in a trap, a FOR/NEXT loop was programmed. The first sequence is FOR N = 1 to 100, starting with the following formula:

$$L = \frac{A^2 \times N^2}{18A + [40 \times CD \times (N + 1)]} \ \mu H \qquad \text{(Eq. 1)}$$

where,

A = Diameter of coil form plus the diameter of the coax, both in inches.

CD = Diameter of coax in inches.

This is the same formula used by Noble except N + 1 rather than N is used to calculate the length of the coil, i.e. the term b in the usual inductance formula. Unless N + 1 is used, the results come out consistently low.

The next step in the first loop is to calculate X_L from L:

$$X_L = 2 \times \pi \times f \times L \ \text{Ohms} \qquad \text{(Eq. 2)}$$

where,

f = Frequency in MHz.

L = Inductance from Eq. 1 in μH.

Next, the capacitance of the coil at N turns is calculated:

$$C = \frac{C_c \times A \times \pi \times N}{12} \ \text{pF per inch} \qquad \text{(Eq. 3)}$$

where,

C_c = Capacitance per foot of coax in pF.

*1904 York St., Kinston, NC 28501

It is important to measure the capacitance of the coax for good results.

The next step in the loop calculates X_c as follows:

$$X_c = \frac{\frac{10^6}{2 \times \pi \times f \times C}}{} \ \text{Ohms} \qquad \text{(Eq. 4)}$$

The computer inserts sequential values of N in the above formulas and calculates X_L and X_c for each N value. When the calculated X_L is equal to or greater than the value of X_c, that is the resonant circuit and the computer moves to the second loop. So far, the computer has calculated the nearest whole number of turns that will satisfy $X_L = X_c$ at f.

The second loop uses the letter M:

FOR M = (N - 1) x 10 TO (N + 1) x 10 (Eq. 5)

where,

N = The turns the computer calculated in the first loop. The computer automatically transfers this value to the second loop.

In the second loop N1 is used for the number of turns:

$$N1 = \frac{M}{10} \qquad \text{(Eq. 6)}$$

The net result is that each unit step in M by the computer increases N1 by 0.1 turns starting at N - 1. N1 now sequences through Eq. 1 to 4 until X_L is again equal or greater than X_c, but this time the number of turns will be calculated to the nearest 0.1 turn.

Why use two loops? The answer is speed. If only one loop was used to calculate 20.0 turns, the computer would have to go through the calculations 200 times and take approximately one minute. With two loops only 5 to 10 seconds are required. The first loop makes 20 calculations to 20 turns and the second loop makes 10 calculations starting at 19 turns to attain 20.0 turns.

The final step is to display the answer. I set up to display X_L, X_c, L, C, and turns. The display of X_L and X_c are a check on the program since the two will be equal or X_L will be slightly

AUDIO FREQUENCY COUNTER PROGRAM

by Charles F. Milazzo, KP4MD

This program will run with as little as 1K of RAM and will allow frequency measurements of up to 28,500 Hz with the ZX-81, TS-1000 or TS-1500 computer. This is useful for tuning RTTY tone generators, electronic musical instruments, tone encoders, and for calibrating audio generators. The audio signal is fed to the computer's earphone jack, and the frequency is displayed to the nearest Hz on the screen.

The work is done by a 62 byte machine language routine which is stored in the first REM statement (memory locations 4082H to 40BFH). The hexadecimal codes should be loaded with a machine code loader having first entered a REM statement with 62 spaces. Alternatively, the decimal equivalents may be individually POKEd into these locations (16514 to 16575). The entry point to the machine language routine is at address 4092H. Here, the value for 28501 (7055H)*is loaded into the BC register pair, the value 3FH is loaded into the D register and the HL register pair is initialized to zero. A call is then made to the cassette port sampling loop at 4082H to 4091H. Each cycle of the loop requires an average of 57.015 machine cycles and decrements the BC register pair by one. When the value of BC equals zero, exactly ½ second has passed and a return is made from the loop. During each loop cycle input port FE is sampled. If the input is high, 3F is loaded into the accumulator; if it is low, then BF is loaded instead. This value is compared with the previous value which had been stored in register D, and the HL register pair is incremented if a change has occurred. As each audio signal cycle involves two transitions, the count in the HL register pair after ½ second is equivalent to the number of audio signal cycles in 1 second. Upon returning from the loop, the previous displayed frequency is erased by printing 5 spaces at the beginning of the display file. If the count in HL was zero a return is made to BASIC, otherwise the print position is returned to the beginning of the display file and the contents of HL are printed as a 5 digit decimal integer with leading zeroes suppressed (using ROM routines called at 40B4H through 40BCH). The screen is blank during the ½ second sampling period and the frequency is displayed during the pause in statement 5. The applied signal voltage should be about 3 or 4 volts (amplification through the cassette recorder's monitor output may be sufficient for some weaker signals). Lowest measurable frequency varies from 100 to 200 Hz and is limited by the computer's cassette port circuitry.

The accuracy of the frequency count depends on the computer's clock frequency which is nominally 3.25 MHz. The TS-1500 which uses a quartz crystal is very accurate. However, the frequency of the ceramic elements in the other models may vary significantly. The initial value of the BC register pair can be changed to compensate for these variations. Measure the clock frequency with a counter or a loosely-coupled well-calibrated receiver. Divide the frequency in Hz by 114.03 and convert to hexadecimal. Load the least significant byte into the B register;*add 1 to the most significant byte and load into the C register. E.g., for a clock frequency of 3.225 MHz: 3225000/114.03 = 28282 = 6E7AH. Change machine code at 4092H to 016F7A (LD BC,7A6F).

LISTING - PREVIOUS PAGE

```
  1 REM PROGRAM BY JAMES REISER
T AD1C FROM HAM RADIO JUNE 1984
  2 REM CONVERTED TO T/S1000 BY
 LESLIE VARNICLE WA3OLW JULY 3 1
984
  10 PRINT AT 11,0;"METEOR SHOWE
R PEAK PREDICTIONS"
  20 PAUSE 100
  30 CLS
  40 PRINT "PLEASE ENTER YEAR (C
G. 1984)"
  50 INPUT Y
  60 CLS
  65 LET K=57.29577951308
  70 PRINT TAB 10;"METEOR SHOWER
S"
  75 PRINT TAB 10;"-------------
-"
  80 PRINT
  90 PRINT " 1) QUADRANTIDS   1-
4 JAN"
  95 PRINT " 2) APRIL LYRIDS   2
0-23 APR"
 100 PRINT " 3) ETA AQUARIDS   2
-6 MAY"
 105 PRINT " 4) ARIETIDS   1-15
JUNE"
 110 PRINT " 5) JUNE LYRIDS   10
-14 JUNE"
 115 PRINT " 6) DELTA AQUARIDS
26-30 JULY"
 120 PRINT " 7) PERSEIDS   10-14
AUG"
 125 PRINT " 8) ORIONIDS   18-23
OCT"
 130 PRINT " 9) TAURIDS   30 OCT
-10 NOV"
 135 PRINT "10) LEONIDS   14-19
NOV"
 140 PRINT "11) GEMINIDS   10-15
DEC"
 145 PRINT "12) URSIDS   21-24 D
EC"
 150 PRINT
 155 PRINT " INPUT SHOWER NUMBER
 (1 TO 12)"
 160 INPUT N
 165 IF N<1 OR N>12 THEN GOTO 16
0
 170 IF N=1 THEN GOTO 600
 175 IF N=2 THEN GOTO 650
 180 IF N=3 THEN GOTO 700
 185 IF N=4 THEN GOTO 750
 190 IF N=5 THEN GOTO 800
 195 IF N=6 THEN GOTO 850
 200 IF N=7 THEN GOTO 900
 205 IF N=8 THEN GOTO 950
 210 IF N=9 THEN GOTO 1000
 215 IF N=10 THEN GOTO 1050
 220 IF N=11 THEN GOTO 1100
 225 IF N=12 THEN GOTO 1150
 270 LET J=365*(Y-1981)+INT ((Y-
1)/4)-INT ((Y-1)/100)+INT ((Y-1)
/400)
 275 LET J=J+INT (30.55*(M-1)-1.
4)+2*INT ((12-M)/10)+D
 280 IF M<2 OR (Y/4)<>INT (Y/4)
THEN GOTO 290
 285 LET J=J+1
 290 GOSUB 435
 295 IF E1>E THEN GOTO 320
 300 LET J=J+1
 305 LET D=D+1
 310 GOSUB 435
 315 GOTO 295
 320 IF E1<=E THEN GOTO 350
 325 LET E2=E1
 330 LET J=J-1
 335 LET D=D-1
 340 GOSUB 435
 350 LET T=24*((E-E1)/(E2-E1))
 355 LET H0=INT (T)
 360 LET M1=INT (60*(T-H0)+.5)
 365 LET G=100*H0+M1
 370 IF D<=31 THEN GOTO 382
 375 LET D=D-31
 380 LET M=M+1
 382 FOR S=1 TO 17
 383 SCROLL
 384 NEXT S
 390 PRINT "THE ";S$;" METEOR SH
OWER"
 391 SCROLL
 393 PRINT "WILL PEAK ON ";M;"/"
D;"/";Y-1900
 394 SCROLL
 395 PRINT "AT ";G;" GMT"
 396 SCROLL
 397 PRINT "THE SHOWER LASTS ";D
$
 398 SCROLL
 400 PRINT "ACCURACY IS ";A$
 405 SCROLL
 406 SCROLL
 410 PRINT "ANOTHER PREDICTION?
(Y/N)"
 411 FOR P=1 TO 6
 412 SCROLL
 413 NEXT P
 415 INPUT Y$
 420 IF Y$="Y" THEN GOTO 30
 425 IF Y$="YES" THEN GOTO 30
 430 GOTO 9997
 435 LET T1=(J-276)/36525
 440 LET C0=0.016717-0.00004*T1
 445 LET M2=(0.985609*(J-117.821
)-0.3227*T1)/K
 450 LET C2=M2+C0*SIN (M2)
 455 LET M0=C2-C0*SIN (C2)
 460 LET D0=(M2-M0)/(1-C0*COS (C
2))
 465 LET C2=C2+D0
 470 IF ABS (D0)>0.0001 THEN GOT
O 455
 475 LET T=K*2*ATN (SQR ((1+C0)/
(1-C0))*SIN (C2/2)/COS (C2/2))
 480 LET E1=T+1.7192*T1-77.396
 485 IF E1<0 THEN LET E1=E1+360
 490 RETURN
 600 LET S$="QUADRANTIDS"
 610 LET E=282.83
 620 LET D$="10 HOURS"
 630 LET A$="+/-15 MINS"
 635 LET M=1
 640 LET D=4
 645 GOTO 250
 650 LET S$="LYRIDS"
 660 LET E=31.4
 670 LET D$="2 DAYS"
 680 LET A$="+/-12 HOURS"
 685 LET M=4
 690 LET D=21
 695 GOTO 250
 700 LET S$="ETA AQUARIDS"
 710 LET E=44.0
 720 LET D$="5 DAYS"
 730 LET A$="+/-12 HOURS"
 735 LET M=5
 740 LET D=4
 745 GOTO 250
 750 LET S$="ARIETIDS"
 760 LET E=75.0
 770 LET D$="8 DAYS"
 780 LET A$="+/-12 HOURS"
 785 LET M=6
 790 LET D=5
 795 GOTO 250
 800 LET S$="JUNE LYRIDS"
 810 LET E=84.0
 820 LET D$="2 DAYS"
 830 LET A$="+/-12 HOURS"
 835 LET M=6
 840 LET D=14
 845 GOTO 250
 850 LET S$="DELTA AQUARIDS"
 860 LET E=125.0
 870 LET D$="2 DAYS"
 880 LET A$="+/-12 HOURS"
 885 LET M=7
 890 LET D=26
 895 GOTO 250
 900 LET S$="PERSEIDS"
 910 LET E=139.3
 920 LET D$="4 DAYS"
 930 LET A$="+/-75 MINS"
 935 LET M=8
 940 LET D=11
 945 GOTO 250
 950 LET S$="ORIONIDS"
 960 LET E=207.0
 970 LET D$="2 DAYS"
 980 LET A$="+/-12 HOURS"
 985 LET M=10
 990 LET D=20
 995 GOTO 250
1000 LET S$="TAURIDS"
1010 LET E=220.0
1020 LET D$="20 DAYS"
1030 LET A$="+/-12 HOURS"
1035 LET M=10
1040 LET D=31
1045 GOTO 250
1050 LET S$="LEONIDS"
1060 LET E=234.7
1070 LET D$="3 HOURS"
1080 LET A$="+/-12 HOURS
1085 LET M=11
1090 LET D=15
1095 GOTO 250
1100 LET S$="GEMINIDS"
1110 LET E=261.6
1120 LET D$="2 DAYS"
1130 LET A$="+/-12 HOURS
1135 LET M=12
1140 LET D=13
1145 GOTO 250
1150 LET S$="URSIDS"
1160 LET E=270.0
1170 LET D$="12 HOURS"
1180 LET A$="+/-12 HOURS"
1185 LET M=12
1190 LET D=21
1195 GOTO 250
9997 STOP
9998 SAVE "METEOR"
9999 GOTO 0
```


AUDIO FREQUENCY COUNTER PROGRAM
MACHINE LANGUAGE ROUTINE

```
4082:1002       DJNZ E
4084:0D         DEC C
4085:C8         RET Z
4086:DBFE       IN A,(N)
4088:BA         CP D
4089:2804       JR Z,E
408B:57         LD D,A
408C:23         INC HL
408D:18F3       JR E
408F:C0         RET NZ
4090:18F0       JR E
4092:017055     LD BC,NN
4095:163F       LD D,N
4097:210000     LD HL,NN
409A:CD8640     CALL NN
409D:E5         PUSH HL
409E:CDF508     CALL NN
40A1:0605       LD B,N
40A3:AF         XOR A
40A4:D7         RST 10H
40A5:10FC       DJNZ E
40A7:E1         POP HL
40A8:7C         LD A,H
40A9:B5         OR L
40AA:C8         RET Z
40AB:E5         PUSH HL
40AC:010000     LD BC,NN
40AF:CDF508     CALL NN
40B2:E1         POP HL
40B3:E5         PUSH HL
40B4:1E00       LD E,N
40B6:01F0D8     LD BC,NN
40B9:CDE107     CALL NN
40BC:CDAD0A     CALL NN
40BF:C9         RET
```

ARTICLE - NEXT PAGE

teacher! For 16K ZX/TS-1000. Send $ 8.95
for tape, listing, & doc. to CLEM WEHNER,
K5KGM, 2135A, Willowwood Lane, Scott, IL
62225.

AUDIO FREQUENCY COUNTER PROGRAM
BY CHARLES F. MILAZZO, KP4MD
1 SEP 1984

```
   1 REM ("$COS <= RETURN ■C■ ??/
 NEXT ""/ LIST "??-Z5  LN ■GND L
AST LN PRINT ■■■ ■NOT ( UNPLOT LP
RINT ?■COS FAST "  LN PRINT ■ L
RINT FAST 2 "  LIST **LN LPRINT ■
LN ■■TAN
   2 FAST
   3 PRINT AT 0,6;"HZ FREQUENCY
COUNTER"
   4 RAND USR 16530
   5 PAUSE 150
   6 GOTO 4
```

greater than X_c.

Test vs. calculated results are shown in Table 1. My procedure is not the best choice for a small calculator. Noble's Eq. 4 can be substituted for mine and might work best. Make several calculations for frequency on each side of the desired frequency and plot these vs. the turns in each calculation. Then, pick off the turns at the desired frequency. I believe you should use N + 1 rather than N in the numerator of his formula for better accuracy. (Use N in the denominator.)

Picking up Eq. 4 from Frank Noble's Technical Correspondence article, we have:

$$f = 127 \sqrt{\frac{9d + 20\,bn}{\varepsilon\, d^3\, n^3}} \text{ MHz} \qquad \text{(Eq. 4)}$$

where,

ε = capacitance per inch of cable, in pF.
d = diameter (to center conductor) of coil in inches.
n = number of turns.

For RG-58/U:

b = 0.195 inch.
ε = 2.375 pF per inch.

Table 1

Test vs. Calculated Results

Coax Type	Form dia. inches	Meas. pF/ft* Coax	Coax dia. inches	Actual Number Turns	Meas.** Resonant Freq., MHz	Calculated Turns
58A/U	1.69	32.4	0.2	13.1	5.57	12.8
58A/U	1.25	36.6	0.2	7.2	14.08	7.5
59	1.69	21	0.242	5.8	18.68	5.7

* Measured with a calibrated Heathkit RCL bridge. Several feet were measured and divided by the number of feet.

** Measured with a GDO and a frequency counter.

PROGRAM FOR TIMEX/SINCLAIR 1000

```
5 PRINT "THIS PROGRAM WILL CALCULATE THE (SPACE)
        TURNS REQUIRED FOR A COAX AN-(3 SPACES)
        TENNA TRAP.  IT ALSO GIVES L, C, (SPACE)
        XL, AND XC.  INPUTS ARE COAX (5 SPACES)
        DIA., CAP PER FOOT, COIL FORM (3 SPACES)
        DIA., AND FREQUENCY"
10 PRINT
11 PRINT "ENTER GOTO 20"
20 CLEAR
22 PRINT "ENTER COAX DIA., INS."
30 INPUT CD
40 PRINT AT Ø,27; CD
50 PRINT "ENTER COAX CAP/FT., PF"
60 INPUT CC
70 PRINT AT 1,27; CC
80 PRINT AT 2,Ø; "ENTER COIL FORM DIA., INS."
90 INPUT D
100 PRINT AT 2,27; D
110 PRINT AT 3,Ø; "ENTER FREQ., MHZ"
120 INPUT F
130 PRINT AT 3,27; F
140 LET A = D + CD
150 FOR N = 1 TO 100
160 LET L = A**2*N**2/((18*A) + (40*CD*(N + 1)))
170 LET XL = 2*PI*F*L
180 LET C = A*PI*N*CC/12
190 LET XC = 10**6/(2*PI*F*C)
200 IF XL > = XC THEN GOTO 300
210 NEXT N
300 LET X = (N - 1)*10
310 LET Y = (N + 1)*10
320 FOR M = X TO Y
330 LET N1 = M/10
340 LET L1 = A**2*N1**2/((18*A) + (40*CD*(N + 1)))
350 LET XL1 = 2*PI*F*L1
360 LET C1 = A*PI*N1*CC/12
370 LET XC1 = 10**6/(2*PI*F*C1)
380 IF XL1 > = XC1 THEN GOTO 450
400 NEXT M
450 PRINT AT 5,Ø; "XL ="; AT 5,8; INT(XL1*100)/100
460 PRINT AT 6,Ø; "XC ="; AT 6,8; INT(XC1*100)/100
470 PRINT AT 7,Ø; "L ="; AT 7,8; INT(L1*100)/100
480 PRINT AT 8,Ø; "C ="; AT 8,8; INT(C1*100)/100
490 PRINT AT 9,Ø; "TURNS ="; AT 9,8; N1
500 PRINT AT 11,Ø; "ENTER GOTO 22 FOR RECALCULATION"
510 PRINT AT 13,Ø; "ENTER GOTO 80 TO RECALCULATE (3 SPACES)
    COIL DIA. AND F ONLY."
520 PRINT AT 16,Ø; "ENTER GOTO 110 TO RECALCULATE (2 SPACES)
    F ONLY."
```

QL (5)
Alex. F Burr K5XY

This month the focus of this column is on one of the four software packages which comes with the QL. These packages provide a comprehensive word-processing, planning, information handling, and graphics capability and are integrated in style, structure, design, and in the sharing of information. The word processor is called QUILL, the spreadsheet is called ABACUS, the database is called ARCHIVE, and the graphics program is called EASEL.

This month we will discuss ARCHIVE, the database program. Database programs are by their nature more complex to operate that other general business applications software. ARCHIVE has been designed to reduce this degree of difficulty and at the same time offer a sophisticated multifile relational database.

In common with the other programs in the suite, ARCHIVE can be used immediately, utilizing a database structure provided with the program - a simple but powerful card index ideal for keeping track of QSL cards and various award programs. Thus one can explore and make practical use of the flexible searching, selecting, and matching facilities that allow retrieval of data from any field.

ARCHIVE is language based and can be used to construct comprehensive multifile relational databases with the minimum of experience. The language is similar in operation to SUPERBASIC and utilizes procedures constructed from some eighty commands, allowing the most sophisticated data handling to be performed all within the framework of the familiar information prompting and Help facilities.

Fields and records are defined with variable lengths, being both efficient in memory usage and much more flexible for the user because it is often very difficult to accurately predict data length requirements when first constructing a database. Records can be displayed in any format, and the powerful language allows output to be printed in a preferred style.

Multifile searching and cross-reference is available, and one can even import data from the other programs which come with the QL.

Some of the more important features are listed below.

Multifile relational database with an arbitrary mumber of files with true multifile capability

Variable length fields and records for efficient use of memory and tape

Sorting is extremely rapid for large files from microcassette due to the use of a memory based index technique

Up to 256 fields per record of numeric or text type

84 command words available including if-else-endif construct, all, endall, and do while

Comprehensive numerical functions including all standard mathematical functions (sine, arcsine, log, etc), average, maximum, date, and time

Comprehensive text functions including string slicing, upper and lower case conversion, and code to character conversion

Comprehensive database functions including field types, record number, count, eof, and free memory

Powerful SELECT functions including find, search "expression", and SELECT "expression"

Interpretive or run mode

Line editor, procedure editor, and screen editor

Screen formatting and report formatting editor in the saving and loading of screen formats

Input and output through screen entry or prompt entry

Print, tab, input command words with ink and paper colors for color monitors

In all, it seems to be a rather sophisticated database manager. It is too bad that Sinclair has given no indication as to how much one can get on one of the microcassettes.

Morse Code Teacher (2068)
John Ahlfeld, KB4XH

Here's a morse code teacher program in living color and excellent sound for the TS-2068. Sending speed is adjustable from 5 to 40 words/min. The output sound level is a bit low, so an audio amp may be needed. The Commodore 1702 color monitor has an audio amp and works fine, and the monitor is a good buy at several discount stores. Be sure to use CAPS on the program inputs and if you BREAK the program, use GOTO 11 to restart. For anyone not wishing to type in the listing, I will be happy to provide a copy on tape. Any reasonable donation will be accepted. KB4XH, 5846 SW 50 Terrace, Miami, FL 33155

LISTING-NEXT PAGE

Yagi Antenna Design
KA2LHO

Here is still another Yagi antenna design program. Yagi is a part of the KA2LHO Ham Helper Series, designed to put the

```
  1 REM PROGRAM BY JAMES REISER
T AD1C FROM HAM RADIO JUNE 1984
  2 REM CONVERTED TO T/S1000 BY
 LESLIE VARNICLE WA3OLW JULY 3 1
984
  10 PRINT AT 11,0;"METEOR SHOWE
R PEAK PREDICTIONS"
  20 PAUSE 100
  30 CLS
  40 PRINT "PLEASE ENTER YEAR (C
G. 1984)"
  50 INPUT Y
  60 CLS
  65 LET K=57.29577951308
  70 PRINT TAB 10;"METEOR SHOWER
S"
  75 PRINT TAB 10;"-------------
-"
  80 PRINT
  90 PRINT " 1) QUADRANTIDS   1-
4 JAN"
  95 PRINT " 2) APRIL LYRIDS   2
0-23 APR"
 100 PRINT " 3) ETA AQUARIDS   2
-6 MAY"
 105 PRINT " 4) ARIETIDS   1-15
JUNE"
 110 PRINT " 5) JUNE LYRIDS   10
-14 JUNE"
 115 PRINT " 6) DELTA AQUARIDS
28-30 JULY"
 120 PRINT " 7) PERSEIDS   10-14
AUG"
 125 PRINT " 8) ORIONIDS   18-23
OCT"
 130 PRINT " 9) TAURIDS   30 OCT
-10 NOV"
 135 PRINT "10) LEONIDS   14-19
NOV"
 140 PRINT "11) GEMINIDS   10-15
DEC"
 145 PRINT "12) URSIDS   21-24 D
EC"
 150 PRINT
 155 PRINT " INPUT SHOWER NUMBER
(1 TO 12)"
 160 INPUT N
 165 IF N<1 OR N>12 THEN GOTO 16
0
 170 IF N=1 THEN GOTO 600
 175 IF N=2 THEN GOTO 650
 180 IF N=3 THEN GOTO 700
 185 IF N=4 THEN GOTO 750
 190 IF N=5 THEN GOTO 800
 195 IF N=6 THEN GOTO 850
 200 IF N=7 THEN GOTO 900
 205 IF N=8 THEN GOTO 950
 210 IF N=9 THEN GOTO 1000
 215 IF N=10 THEN GOTO 1050
 220 IF N=11 THEN GOTO 1100
 225 IF N=12 THEN GOTO 1150
 270 LET J=365*(Y-1981)+INT ((Y-
1)/4)-INT ((Y-1)/100)+INT ((Y-1)
/400)
 275 LET J=J+INT (30.55*(M-1)-1.
4)+2*INT ((12-M)/10)+D
 280 IF M<2 OR (Y/4)<>INT (Y/4)
THEN GOTO 290
 285 LET J=J+1
 290 GOSUB 435
 295 IF E1>E THEN GOTO 320
 300 LET J=J+1
 305 LET D=D+1
 310 GOSUB 435
 315 GOTO 295
 320 IF E1<=E THEN GOTO 350
 325 LET E2=E1
 330 LET J=J-1
 335 LET D=D-1
 340 GOSUB 435
 350 LET T=24*((E-E1)/(E2-E1))
 355 LET H0=INT (T)
 360 LET M1=INT (60*(T-H0)+.5)
 365 LET G=100*H0+M1
 370 IF D<=31 THEN GOTO 382
 375 LET D=D-31
 380 LET M=M+1
 382 FOR S=1 TO 17
 383 SCROLL
 384 NEXT S
 390 PRINT "THE ";S$;" METEOR SH
OWER"
 391 SCROLL
 393 PRINT "WILL PEAK ON ";M;"/"
D;"/";Y-1900
 394 SCROLL
 395 PRINT "AT ";G;" GMT"
 396 SCROLL
 397 PRINT "THE SHOWER LASTS ";D
$
 398 SCROLL
 400 PRINT "ACCURACY IS ";A$
 405 SCROLL
 406 SCROLL
 410 PRINT "ANOTHER PREDICTION?
(Y/N)"
 411 FOR P=1 TO 6
 412 SCROLL
 413 NEXT P
 415 INPUT Y$
 420 IF Y$="Y" THEN GOTO 30
 425 IF Y$="YES" THEN GOTO 30
 430 GOTO 9997
 435 LET T1=(J-276)/36525
 440 LET C0=0.016717-0.00004*T1
 445 LET M2=(0.985609*(J-117.821
)-0.3227*T1)/K
 450 LET C2=M2+C0*SIN (M2)
 455 LET M0=C2-C0*SIN (C2)
 460 LET D0=(M2-M0)/(1-C0*COS (C
2))
 465 LET C2=C2+D0
 470 IF ABS (D0)>0.0001 THEN GOT
O 455
 475 LET T=K*2*ATN (SQR ((1+C0)/
(1-C0))*SIN (C2/2)/COS (C2/2))
 480 LET E1=T+1.7192*T1-77.396
 485 IF E1<0 THEN LET E1=E1+360
 490 RETURN
 600 LET S$="QUADRANTIDS"
 610 LET E=282.83
 620 LET D$="10 HOURS"
 630 LET A$="+/-15 MINS"
 635 LET M=1
 640 LET D=4
 645 GOTO 250
 650 LET S$="LYRIDS"
 660 LET E=31.4
 670 LET D$="2 DAYS"
 680 LET A$="+/-12 HOURS"
 685 LET M=4
 690 LET D=21
 695 GOTO 250
 700 LET S$="ETA AQUARIDS"
 710 LET E=44.0
 720 LET D$="5 DAYS"
 730 LET A$="+/-12 HOURS"
 735 LET M=5
 740 LET D=4
 745 GOTO 250
 750 LET S$="ARIETIDS"
 760 LET E=75.0
 770 LET D$="8 DAYS"
 780 LET A$="+/-12 HOURS"
 785 LET M=6
 790 LET D=5
 795 GOTO 250
 800 LET S$="JUNE LYRIDS"
 810 LET E=84.0
 820 LET D$="2 DAYS"
 830 LET A$="+/-12 HOURS"
 835 LET M=6
 840 LET D=14
 845 GOTO 250
 850 LET S$="DELTA AQURIDS"
 860 LET E=125.0
 870 LET D$="2 DAYS"
 880 LET A$="+/-12 HOURS"
 885 LET M=7
 890 LET D=26
 895 GOTO 250
 900 LET S$="PERSEIDS"
 910 LET E=139.3
 920 LET D$="4 DAYS"
 930 LET A$="+/-75 MINS"
 935 LET M=8
 940 LET D=11
 945 GOTO 250
 950 LET S$="ORIONIDS"
 960 LET E=207.0
 970 LET D$="2 DAYS"
 980 LET A$="+/-12 HOURS"
 985 LET M=10
 990 LET D=20
 995 GOTO 250
1000 LET S$="TAURIDS"
1010 LET E=220.0
1020 LET D$="20 DAYS"
1030 LET A$="+/-12 HOURS"
1035 LET M=10
1040 LET D=31
1045 GOTO 250
1050 LET S$="LEONIDS"
1060 LET E=234.7
1070 LET D$="3 HOURS"
1080 LET A$="+/-12 HOURS
1085 LET M=11
1090 LET D=16
1095 GOTO 250
1100 LET S$="GEMINIDS"
1110 LET E=261.2
1120 LET D$="1 DAYS"
1130 LET A$="+/-12 HOURS
1135 LET M=12
1140 LET D=13
1145 GOTO 250
1150 LET S$="URSIDS"
1160 LET E=270.0
1170 LET D$="12 HOURS"
1180 LET A$="+/-12 HOURS"
1185 LET M=12
1190 LET D=21
1195 GOTO 250
9997 STOP
9998 SAVE "METEO■"
9999 GOTO 0
```

teacher! For 16K ZX/TS-1000. Send $ 8.95 for tape, listing, & doc. to CLEM WEHNER, K5KGM, 2135A, Willowwood Lane, Scott, IL 62225.

ARTICLE - NEXT PAGE

AUDIO FREQUENCY COUNTER PROGRAM
MACHINE LANGUAGE ROUTINE

```
4082:1002       DJNZ E
4084:0D         DEC C
4085:C8         RET Z
4086:DBFE       IN A,(N)
4088:BA         CP D
4089:2804       JR Z,E
408B:57         LD D,A
408C:23         INC HL
408D:18F3       JR E
408F:C0         RET NZ
4090:18F0       JR E
4092:017Ø55     LD BC,NN
4095:163F       LD D,N
4097:210000     LD HL,NN
409A:CD8640     CALL NN
409D:E5         PUSH HL
409E:CDF506     CALL NN
40A1:0605       LD B,N
40A3:AF         XOR A
40A4:D7         RST 10H
40A5:10FC       DJNZ E
40A7:E1         POP HL
40A8:7C         LD A,H
40A9:B5         OR L
40AA:C8         RET Z
40AB:E5         PUSH HL
40AC:010000     LD BC,NN
40AF:CDF506     CALL NN
40B2:E1         POP HL
40B3:E5         PUSH HL
40B4:1E00       LD E,N
40B6:01F0D8     LD BC,NN
40B9:CDE107     CALL NN
40BC:CDAD0A     CALL NN
40BF:C9         RET
```

AUDIO FREQUENCY COUNTER PROGRAM
BY CHARLES F. MILAZZO, KP4MD
1 SEP 1984

```
   1 REM ( "$COS <= RETURN ■C. ??/
 NEXT ""/ LIST "??-Z5  LN "RND "F
AST LN PRINT ■"■NOT ( UNPLOT LP
RINT ?■COS FAST "  LN PRINT ■ LP
RINT FAST 2 "  LIST **LN LPRINT "
LN ■"TAN
   2 FAST
   3 PRINT AT 0,6;"HZ FREQUENCY
COUNTER"
   4 RAND USR 16530
   5 PAUSE 150
   6 GOTO 4
```

AUDIO FREQUENCY COUNTER PROGRAM

by Charles F. Milazzo, KP4MD

This program will run with as little as 1K of RAM and will allow frequency measurements of up to 28,500 Hz with the ZX-81, TS-1000 or TS-1500 computer. This is useful for tuning RTTY tone generators, electronic musical instruments, tone encoders, and for calibrating audio generators. The audio signal is fed to the computer's earphone jack, and the frequency is displayed to the nearest Hz on the screen.

The work is done by a 62 byte machine language routine which is stored in the first REM statement (memory locations 4082H to 40BFH). The hexadecimal codes should be loaded with a machine code loader having first entered a REM statement with 62 spaces. Alternatively, the decimal equivalents may be individually POKEd into these locations (16514 to 16575). The entry point to the machine language routine is at address 4092H. Here, the value for 28501 (7055H)*is loaded into the BC register pair, the value 3FH is loaded into the D register and the HL register pair is initialized to zero. A call is then made to the cassette port sampling loop at 4082H to 4091H. Each cycle of the loop requires an average of 57.015 machine cycles and decrements the BC register pair by one. When the value of BC equals zero, exactly ½ second has passed and a return is made from the loop. During each loop cycle input port FE is sampled. If the input is high, 3F is loaded into the accumulator; if it is low, then BF is loaded instead. This value is compared with the previous value which had been stored in register D, and the HL register pair is incremented if a change has occurred. As each audio signal cycle involves two transitions, the count in the HL register pair after ½ second is equivalent to the number of audio signal cycles in 1 second. Upon returning from the loop, the previous displayed frequency is erased by printing 5 spaces at the beginning of the display file. If the count in HL was zero a return is made to BASIC, otherwise the print position is returned to the beginning of the display file and the contents of HL are printed as a 5 digit decimal integer with leading zeroes suppressed (using ROM routines called at 40B4H through 40BCH). The screen is blank during the ½ second sampling period and the frequency is displayed during the pause in statement 5. The applied signal voltage should be about 3 or 4 volts (amplification through the cassette recorder's monitor output may be sufficient for some weaker signals). Lowest measurable frequency varies from 100 to 200 Hz and is limited by the computer's cassette port circuitry.

The accuracy of the frequency count depends on the computer's clock frequency which is nominally 3.25 MHz. The TS-1500 which uses a quartz crystal is very accurate. However, the frequency of the ceramic elements in the other models may vary significantly. The initial value of the BC register pair can be changed to compensate for these variations. Measure the clock frequency with a counter or a loosely-coupled well-calibrated receiver. Divide the frequency in Hz by 114.03 and convert to hexadecimal. Load the least significant byte into the B register;*add 1 to the most significant byte and load into the C register. E.g., for a clock frequency of 3.225 MHz: 3225000/114.03 = 28282 = 6E7AH. Change machine code at 4092H to 016F7A (LD BC,7A6F).

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QL (5)
Alex. F Burr K5XY

This month the focus of this column is on one of the four software packages which comes with the QL. These packages provide a comprehensive word-processing, planning, information handling, and graphics capability and are integrated in style, structure, design, and in the sharing of information. The word processor is called QUILL, the spreadsheet is called ABACUS, the database is called ARCHIVE, and the graphics program is called EASEL.

This month we will discuss ARCHIVE, the database program. Database programs are by their nature more complex to operate that other general business applications software. ARCHIVE has been designed to reduce this degree of difficulty and at the same time offer a sophisticated multifile relational database.

In common with the other programs in the suite, ARCHIVE can be used immediately, utilizing a database structure provided with the program - a simple but powerful card index ideal for keeping track of QSL cards and various award programs. Thus one can explore and make practical use of the flexible searching, selecting, and matching facilities that allow retrieval of data from any field.

ARCHIVE is language based and can be used to construct comprehensive multifile relational databases with the minimum of experience. The language is similar in operation to SUPERBASIC and utilizes procedures constructed from some eighty commands, allowing the most sophisticated data handling to be performed all within the framework of the familiar information prompting and Help facilities.

Fields and records are defined with variable lengths, being both efficient in memory usage and much more flexible for the user because it is often very difficult to accurately predict data length requirements when first constructing a database. Records can be displayed in any format, and the powerful language allows output to be printed in a preferred style.

Multifile searching and cross-reference is available, and one can even import data from the other programs which come with the QL.

Some of the more important features are listed below.

Multifile relational database with an arbitrary mumber of files with true multifile capability

Variable length fields and records for efficient use of memory and tape

Sorting is extremely rapid for large files from microcassette due to the use of a memory based index technique

Up to 256 fields per record of numeric or text type

84 command words available including if-else-endif construct, all, endall, and do while

Comprehensive numerical functions including all standard mathematical functions (sine, arcsine, log, etc), average, maximum, date, and time

Comprehensive text functions including string slicing, upper and lower case conversion, and code to character conversion

Comprehensive database functions including field types, record number, count, eof, and free memory

Powerful SELECT functions including find, search "expression", and SELECT "expression"

Interpretive or run mode

Line editor, procedure editor, and screen editor

Screen formatting and report formatting editor in the saving and loading of screen formats

Input and output through screen entry or prompt entry

Print, tab, input command words with ink and paper colors for color monitors

In all, it seems to be a rather sophisticated database manager. It is too bad that Sinclair has given no indication as to how much one can get on one of the microcassettes.

Morse Code Teacher (2068)
John Ahlfeld, KB4XH

Here's a morse code teacher program in living color and excellent sound for the TS-2068. Sending speed is adjustable from 5 to 40 words/min. The output sound level is a bit low, so an audio amp may be needed. The Commodore 1702 color monitor has an audio amp and works fine, and the monitor is a good buy at several discount stores. Be sure to use CAPS on the program inputs and if you BREAK the program, use GOTO 11 to restart. For anyone not wishing to type in the listing, I will be happy to provide a copy on tape. Any reasonable donation will be accepted. KB4XH, 5846 SW 50 Terrace, Miami, FL 33155

LISTING-NEXT PAGE

Yagi Antenna Design
KA2LHO

Here is still another Yagi antenna design program. Yagi is a part of the KA2LHO Ham Helper Series, designed to put the

greater than X .
c

Test vs. calculated results are shown in Table 1. My procedure is not the best choice for a small calculator. Noble's Eq. 4 can be substituted for mine and might work best. Make several calculations for frequency on each side of the desired frequency and plot these vs. the turns in each calculation. Then, pick off the turns at the desired frequency. I believe you should use N + 1 rather than N in the numerator of his formula for better accuracy. (Use N in the denominator.)

Picking up Eq. 4 from Frank Noble's Technical Correspondence article, we have:

$$f = 127 \sqrt{\frac{9d + 20\ bn}{\varepsilon\ d^3\ n^3}}\ \text{MHz} \qquad \text{(Eq. 4)}$$

where,

ε = capacitance per inch of cable, in pF.
d = diameter (to center conductor) of coil in inches.
n = number of turns.

For RG-58/U:

b = 0.195 inch.
ε = 2.375 pF per inch.

Table 1

Test vs. Calculated Results

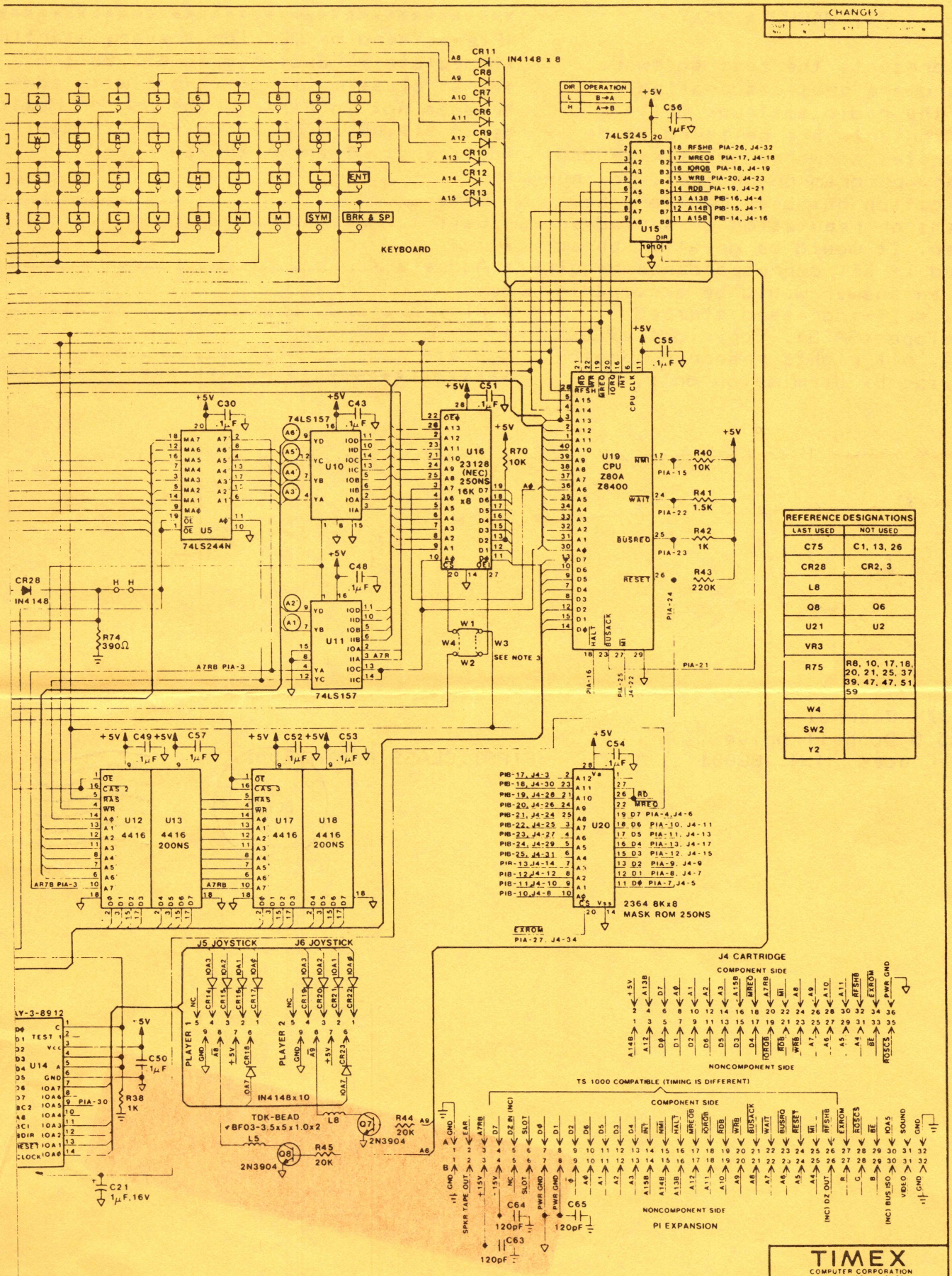
Coax Type	Form dia. inches	Meas. pF/ft* Coax	Coax dia. inches	Actual Number Turns	Meas.** Resonant Freq., MHz	Calculated Turns
58A/U	1.69	32.4	0.2	13.1	5.57	12.8
58A/U	1.25	36.6	0.2	7.2	14.08	7.5
59	1.69	21	0.242	5.8	18.68	5.7

* Measured with a calibrated Heathkit RCL bridge. Several feet were measured and divided by the number of feet.

** Measured with a GDO and a frequency counter.

PROGRAM FOR TIMEX/SINCLAIR 1000

```
 5 PRINT "THIS PROGRAM WILL CALCULATE THE (SPACE)
         TURNS REQUIRED FOR A COAX AN-(3 SPACES)
         TENNA TRAP.  IT ALSO GIVES L, C, (SPACE)
         XL, AND XC.  INPUTS ARE COAX (5 SPACES)
         DIA., CAP PER FOOT, COIL FORM (3 SPACES)
         DIA., AND FREQUENCY"
 10 PRINT
 11 PRINT "ENTER GOTO 20"
 20 CLEAR
 22 PRINT "ENTER COAX DIA., INS."
 30 INPUT CD
 40 PRINT AT Ø,27; CD
 50 PRINT "ENTER COAX CAP/FT., PF"
 60 INPUT CC
 70 PRINT AT 1,27; CC
 80 PRINT AT 2,Ø; "ENTER COIL FORM DIA., INS."
 90 INPUT D
 100 PRINT AT 2,27; D
 110 PRINT AT 3,Ø; "ENTER FREQ., MHZ"
 120 INPUT F
 130 PRINT AT 3,27; F
 140 LET A = D + CD
 150 FOR N = 1 TO 100
 160 LET L = A**2*N**2/((18*A) + (4Ø*CD*(N + 1)))
 170 LET XL = 2*PI*F*L
 180 LET C = A*PI*N*CC/12
 190 LET XC = 1Ø**6/(2*PI*F*C)
 200 IF XL > = XC THEN GOTO 300
 210 NEXT N
 300 LET X = (N - 1)*10
 310 LET Y = (N + 1)*10
 320 FOR M = X TO Y
 330 LET N1 = M/10
 340 LET L1 = A**2*N1**2/((18*A) + (4Ø*CD*(N + 1)))
 350 LET XL1 = 2*PI*F*L1
 360 LET C1 = A*PI*N1*CC/12
 370 LET XC1 = 1Ø**6/(2*PI*F*C1)
 380 IF XL1 > = XC1 THEN GOTO 450
 400 NEXT M
 450 PRINT AT 5,Ø; "XL ="; AT 5,8; INT(XL1*100)/100
 460 PRINT AT 6,Ø; "XC ="; AT 6,8; INT(XC1*100)/100
 470 PRINT AT 7,Ø; "L ="; AT 7,8; INT(L1*100)/100
 480 PRINT AT 8,Ø; "C ="; AT 8,8; INT(C1*100)/100
 490 PRINT AT 9,Ø; "TURNS ="; AT 9,8; N1
 500 PRINT AT 11,Ø; "ENTER GOTO 22 FOR RECALCULATION"
 510 PRINT AT 13,Ø; "ENTER GOTO 80 TO RECALCULATE (3 SPACES)
     COIL DIA. AND F ONLY."
 520 PRINT AT 16,Ø; "ENTER GOTO 110 TO RECALCULATE (2 SPACES)
     F ONLY."
```


CHANGES
KEYBOARD
IN4148 x 8
74LS245
U15
74LS244N
U5
74LS157
U10
U11
U16
23128 (NEC) 250NS 16K x8
U19 CPU Z80A Z8400
U12 4416 200NS
U13 4416 200NS
U17 4416 200NS
U18 4416 200NS
U20 2364 8Kx8 MASK ROM 250NS
J5 JOYSTICK
J6 JOYSTICK
J4 CARTRIDGE
COMPONENT SIDE
NONCOMPONENT SIDE
TS 1000 COMPATIBLE (TIMING IS DIFFERENT)
PI EXPANSION
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BF03-3.5x5x1.0x2
2N3904
IN4148x10
+5V
CR28
R74 390Ω
R70 10K
R40 10K
R41 1.5K
R42 1K
R43 220K
R38 1K
R44 20K
R45 20K
C64 120pF
C65 120pF
C63 120pF
C21 1μF,16V
C50 1μF
W1
W2
W3
W4
SEE NOTE 3
A7RB PIA-3
PIA-15
PIA-22
PIA-23
PIA-24
PIA-21
PIA-16
PIA-25
PIA-27, J4-34
REFERENCE DESIGNATIONS
LAST USED | NOT USED
C75 | C1, 13, 26
CR28 | CR2, 3
L8 |
Q8 | Q6
U21 | U2
VR3 |
R75 | R8, 10, 17, 18, 20, 21, 25, 37 39, 47, 47, 51, 59
W4 |
SW2 |
Y2 |
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73, W4GHV & K5XY

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